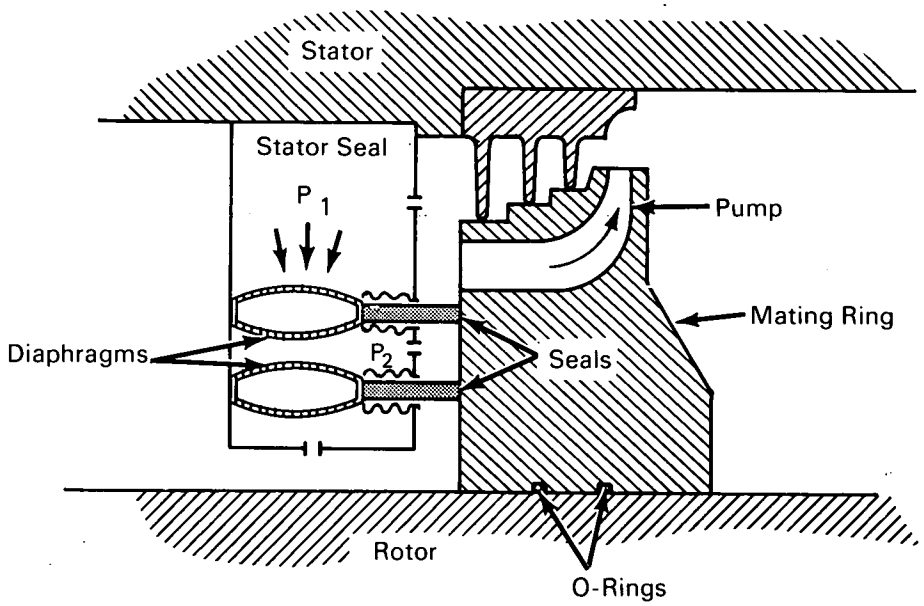
NASA TECH BRIEF

Cryogenic Seal Concept for Static and Dynamic Conditions



The problem:

To design a system that will reduce cryogenic pump seal leakage under static and dynamic conditions.

The solution:

Seal rings fitted into annular diaphragms, which are affected by cryogenic pressure and temperature to move against a mating ring, to increase seal bearing loads under static conditions.

How it's done:

The seal assembly consists of a stator-seal housing with primary and secondary seal rings fitted into annular diaphragms and preloaded against a rotor-mounted mating ring. The seal ring bearing load is increased during static conditions by the static pressure P_1 and temperature of the cryogen. The static pressure P_1 bearing on the diaphragms and the cryogenic temperature (which lowers the diaphragm pressure) will cause inward deflection on the stator seal diaphragms, thereby increasing bearing force for improved sealing.

The function of the secondary stator seal is to create a cavity to trap any leakage past the primary seal. Any pressure P_2 increase in the cavity between the diaphragms due to leakage will result in increased bearing loads to both stator seals. During dynamic conditions, the stator seal bearing loads must be reduced to prevent overheating and excessive wear. This is accomplished by a small pump built into the rotor mating ring, that lowers the stator-seal pressure and relieves the stator seal bearing loads as the pump operates.

(continued overleaf)

Notes:

1. This concept is applicable to any rotating machinery where pressure actuated sealing under cryogenic conditions is useful.
2. This development is in conceptual stage only, and, as of date of publication of this Tech Brief, neither a model nor prototype has been constructed.

Patent status:

No patent action is contemplated by NASA.

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